Online ISSN 3007-3197 Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 3, Issue 7 (2025)

Study on Prevalance of Subclinical Mastitis and Associated Risk Factors of Dairy Cows in District Muzaffargarh

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Article Details

Keywords: Prevalence, Risk Factors, Crossbred Cows, CMT, Subclinical Mastitis and Cattle Management Techniques

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ABSTRACT

The study was conducted to evaluate the prevalence and associated risk factors of Mastitis in Dairy Cows. Because of its effects on milk production and animal health, subclinical mastitis (SCM) poses a serious issue to the dairy industry. The purpose of this study was to ascertain the prevalence of subclinical mastitis in dairy cows and to pinpoint risk variables that are linked to it. Somatic cell count (SCC) testing was used to screen a total of 100 dairy cows from District Muzaffargarh. Subclinical mastitis was reported to be 41% prevalent overall. High milking frequency ($p < 0.05$), advanced lactation stage ($p < 0.01$), and inadequate sanitation methods ($p < 0.01$) were risk variables substantially linked to SCM. The results emphasize that customized management approaches are required to reduce the incidence of subclinical mastitis and enhance the production and health of dairy herds. Subclinical mastitis is a prevalent and noteworthy ailment that impacts dairy cows, resulting in decreased milk yield and escalated medical expenses. This study aims to determine the major factors influencing the occurrence of subclinical mastitis and to assess its prevalence. One hundred dairy cows participated in a cross-sectional survey. Somatic cell count (SCC) analysis and the California Mastitis Test (CMT) were used to diagnose subclinical mastitis. Structured questionnaires and observational evaluations were used to gather data on environmental factors, cow health, and farm management techniques. A statistical analysis was conducted to determine any correlations between putative risk factors and prevalence.

DOI: Availability

INTRODUCTION

Clinical mastitis is characterized by obvious alterations to the milk and udder, whereas subclinical mastitis is characterized by an increase in inflammatory cells in the milk but no abnormalities to the milk or udder. In order to lower the incidence of mastitis, hygienic measures such as culling, teat sealers, dry cow therapy, milking machines, dietary supplements, and culling are applied during milk collection. Dirty teats and udders are cleaned aseptically and thoroughly dried before sample collection. Mastitis in cows affects both the amount and quality of milk produced, making it a disease with significant economic implications. The direct costs of CM include wasted milk, medication costs, labor costs, and indirect costs like higher culling and lost future production. The complicated illness known as mastitis involves interactions between the host, microbes, and environment. Physical examinations, bacteriological analyses, and screening tests are frequently used to diagnose mastitis. Intramammary antimicrobials pumped into the udder through the teat canal and parenteral therapy done by injection are two distinct ways to treat mastitis. The disease has not received enough research attention, and little is known about its prevalence and risk factors. This review aims to provide general information about the state of bovine mastitis in the research area among small-holder lactating dairy cows. Staphylococcus aureus is one of the main pathogens that can be quite important in the development of mastitis (Lade, A., et al., 2024). Furthermore, the occurrence of antibiotic resistance in cases of Staphylococcus aureus-induced bovine mastitis is on the rise daily (Borena, Bezunesh Mideksa et al., 2023). The goal of the current study was to ascertain the prevalence, risk factors, and antibiotic resistance of Staphylococcus aureus from bovine subclinical mastitis in the Pakistani district of Muzaffargarh, taking into account the economic significance of the condition for the country. There are no outward signs of the illness in the milk or udder, subclinical mastitis causes changes in the composition of the milk, a rise in somatic cell count, a decrease in milk output, and the presence of pathogens in secretions.

OBJECTIVES

- To highlight the risk factors associated with subclinical mastitis in cattle in the Area District Muzaffargarh.
- To determine the prevalence of subclinical mastitis and its animal origin.

MATERIALS AND METHODS

EXPERIMENTAL AREA

The Muzaffargarh district lies in the Punjab province of Pakistan. Its capital is called

Muzaffargarh City. It can be found on the bank of the Chenab River. North 30°4′ 10′ ′ and East 71°11′ 39′ ′ are its coordinates. A triangle at Alipur Tehsil and the Chenab and Indus rivers, which run parallel to the district's eastern and western boundaries, respectively, comprise the 8,249 km² that makes up Muzaffargarh.

STUDY LOCATION

The Qureshi Dairy farm in Moza Mubarakpur and several other small dairy farmers in the same union council (Jagatpur), Tehsil, and District of Muzaffargarh were the subjects of this union-level study. Relevant information, such as milk output, was gathered.

SAMPLE COLLECTION

A milk sample was obtained from one hundred animals. After milk samples were physically inspected, three indirect tests were employed for this investigation: the White Side Test (WST), the California Mastitis Test (CMT), and the Surf Field Mastitis Test (SFMT) to screen for subclinical mastitis. Individual quarter milk samples from the udders of hand-milking, seemingly healthy cows were collected aseptically. Before any antibiotics were administered to these animals, at least one month had passed before samples were taken.

FIGURE FOR MILK SAMPLE COLLECTION SURF FIELD MASTITIS TEST (SFMT)

Surf Excel, a household detergent manufactured by Unilever in Pakistan, was used in a three percent solution (pH 10.3). To make a 3% surf solution, thirty grams of surf were combined with one liter of boiling cold water.

FIGURE SURF FIELD MASTITIS TEST

THE CMT, OR CALIFORNIA MASTITIS TEST

An equal volume of milk from the appropriate cow dung was added to four cups of CMT paddle on a horizontal plane along with a drop of CMT reagent, and the mixture was gently swirled. Based on the thickness of the gel created by the combination of the CMT reagent and milk, the test result was interpreted and assigned a score of ++ (distinctive positive), +++ (highly positive), negative (0), trace (T), or +. Quarters were considered positive if they had a CMT score of + or higher.

SOMATIC CELL COUNT (SCC)

Typical Range: In healthy cows, the SCC is typically less than 200,000 cells per milliliter. Subclinical Mastitis: Subclinical mastitis is defined by inflammation without any obvious symptoms of illness and occurs when there are 200,000 to 500,000 cells per milliliter. Clinical Mastitis: This condition is often accompanied by visible symptoms such as redness, swelling, or abnormal milk production. It is also often linked to SCC levels greater than 500,000 cells per milliliter.

WHITE SIDE TEST (WST)

Every part of the animal should have a little sample of milk taken. To determine whether mastitis is present more accurately, make sure the samples originate from the first few streams of milk. To conduct the test, use a dish or other spotlessly clean white surface. It is simpler to observe color variations in the milk due to the white background. Place a small amount of milk onto the area that seems pale. Pay attention to any changes in the milk's color, consistency, or texture. Normal milk should seem uniform and free of clots or flakes. Mastitis symptoms include a noticeable loss in consistency, clotted milk, and noticeable color changes can all be indicators of mastitis. The specific changes can vary depending on the kind of mastitis and whether other infections are present.

DATA ANALYSIS

The Z-test, a statistical test used to ascertain whether two population means are different when

the variances are known and the sample size is large, was utilized to statistically assess the data about the prevalence and likely risk factors/predisposing factors for sub-clinical mastitis in cattle. Comparing a mean to a value that has been hypothesized is another usage for it. For the test to be effective, the data must roughly fit a normal distribution.as well as the Chi-square proportion test. When comparing the estimated proportions between two groups, the Z-test was utilized, and when there were more than two groups of a factor, the Chi square proportion test was employed. A five percent significance level was applied to all computations. Excel 2007 for Microsoft Office was used for all of the analysis.

RESULTS

The purpose of the research was to ascertain the effects of several factors on the prevalence of sub-clinical mastitis in nursing crossbred cows in the Muzaffargarh tehsils. This study sought to determine the prevalence of both clinical and subclinical mastitis in the area while accounting for the district's particular environmental factors and prevailing governmental actions. Milk samples from one hundred nursing cattle were used in this experiment. Countless other variables were noted, including the quantity and stage of lactation, housing circumstances, feeding schedule, teat conditions, milking technique, and duration of lactation. To find out how often mastitis was in the field, the Surf Field Mastitis Test (SFMT) was employed.

SEASONS' IMPACT ON SUB-CLINICAL MASTITIS OCCURRENCE

According to the Z-test results, there is a considerable seasonal variation in the incidence of sub-clinical mastitis. Table 1 indicates that it was higher (52 %) in the winter than it was in the summer (30 %).

SEASON	NO.OF COWS EXAMINED	NO. OF COWS AFFECTED	MASTITIS PREVELANCE (%)
SUMMER	50	15	30
WINTER	50	26	52
TOTAL	100	41	41

FLOOR TYPE'S IMPACT ON SUB-CLINICAL MASTITIS OCCURRENCE

Table 2 indicates that the kind of floor had a substantial impact on the incidence of sub- clinical mastitis in cattle.

TYPE OF FLOOR	ANIMALS OBSERVED	ANIMALS AFFECTED NUMBER	PERCENTAGE (%)
CEMENTED	4	1	25.00
BRICK	1	0	0
KACCHA	95	40	42.10

X2 = 78.64 > 7.38

UDDER SIZE'S IMPACT ON SUB-CLINICAL MASTITIS OCCURRENCE

The likelihood that cattle will develop sub-clinical mastitis is significantly influenced by the size of the udder.

UDDER SIZE	NO.OF COWS OBSERVED	NO.OF COWS AFFECTED	PREVALENCE (%)
SMALL	36	13	36.11
MEDIUM	32	13	40.62
LARGE	32	15	40.87

X2 = 164.43 > 7.38 (Table Value)

EFFECT OF STAGE OF LACTATION ON THE OCCURRENCE OF SUB-CLINICAL MASTITIS

The occurrence of sub-clinical mastitis in nursing cattle is highly correlated with the lactation stage, according to the results of the Chi-square test. According to Table 4, it peaked (45.83%) during the beginning of lactation and at the conclusion (46.77%).

LACTATION STAGE (MONTHS)	NO.OF COWS EXAMINED	NO.OF COWS AFFECTED	MASTITIS PREVALENCE %
0-1	24	11	45.83
2-6	14	1	7.14
7-12	62	29	46.77
TOTAL	100	41	41

X2 = 154.42 > 7.38 (Table Value)

EFFECT OF AGE ON THE OCCURRENCE OF SUB-CLINICAL MASTITIS

It was discovered that as cattle age, the occurrence of mastitis rises. It peaked in the 11–13 year old cattle group (Table 5).

AGE(YEARS)	NO.OF COWS EXAMINED	NO.OF COWS AFFECTED	MASTITIS PREVALENCE (%)
5-7	30	8	26.6
8-10	34	13	38.23
11-13	26	15	57.69
14-16	10	5	50.00
TOTAL	100	41	41

X2 = 476.44 > 9.35 (table value)

EFFECT OF PARITY ON THE OCCURRENCE OF SUB-CLINICAL MASTITIS

Parity has a significant impact on the prevalence of sub-clinical mastitis, according to the Chi-square proportion test. The prevalence of mastitis in the first to second parity was found to be lower (32.14%) than in the third to fourth parity (50.00%), and in the third to fourth parity, it was lower than in the fifth to sixth parity (56.25%), according to Table 6 That means there is a greater chance of sub-clinical mastitis prevalence as parity grows.

PARITY	NO.OF COWS EXAMINED	NO.OF COWS AFFECTED	MASTITIS PREVALENCE (%)
1^{st} to 2^{nd}	56	18	32.14
3^{rd} to 4^{th}	28	14	50.00
5^{th} to 6^{th}	16	9	56.25
Total	100	41	41

X2 = 241.71 > 7.38

EFFECT OF CLEANING OF FLOOR ON THE OCCURRENCE OF SUB-CLINICAL MASTITIS

Table 7 provides information on the relationship between the frequency of floor cleaning and the incidence of mastitis.

TYPE OF FLOOR	ANIMALS OBSERVED	ANIMALS AFFECTED	NUMBER AFFECTED PERCENTAGE %
Once a day	49	28	57.14
Twice a day	32	11	34.37
More than twice	19	2	10.53
Total	100	41	41

X2 = 161.78 > 7.38

FEEDING'S IMPACT ON THE DEVELOPMENT OF SUBCLINICAL MASTITIS

According to Table 8, 64% of cattle are reared on semi-intensive diets, and 36% are fed extensively. Compared to cattle fed semi-intensively (19.0%), cattle fed extensively (22.0%) had a non-significantly greater prevalence of sub-clinical mastitis.

TYPE OF FEEDING	ANIMALS OBSERVED	ANIMALS AFFECTED NUMBER	PERCENTAGE (%)
Semi intensive feeding	64	25	39.06
Extensive feeding	36	16	44.44

Z = -0.47448 > -1.960 (table value)

EFFECT OF NUMBER OF ANIMALS AND HOUSING REGARDING THE SUBCLINICAL MASTITIS OCCURRENCE

The majority of the farmers (49) had just one cow apiece, compared to two for 34 and more for 17 farmers with several cows.

NO.OF FARMERS	NO.OF COWS KEPT BY EACH FARMER	NO.OF COWS OBSERVED	NO.OF COWS AFFECTED	MASTITIS PREVALENCE (%)
49	One	49	19	38.77
34	Two	14	14	41.18
17	More than two	8	8	47.06

X2 = 2.36 < 7.38 (table value)

THE FREQUENCY OF SUBCLINICAL MASTITIS IN BOVINES

In cattle, mastitis and subclinical mastitis were found to be 41 percent common overall (Table 10).

NO.OF CATTLE EXAMINED	NO.OF CATTLE AFFECTED	SUBCLINICAL MASTITIS PREVALENCE (%)
100	41	41

QUARTER WISE PREVALENCE

Out of the 400 quarters from 100 nursing cows, 127 quarters (32.75%) had a positive response to the SFMT test or had sub-clinical mastitis. Sixty-nine percent of the she-cows tested positive in all four quarters.

QUARTER(S)	NO.OF COWS AFFECTED	PERCENT (%)
1	8	19.51
2	5	12.20
3	3	7.32
4	25	60.98
TOTAL	41	41

MILK YIELD

According to the current study's findings, milk yield varied from 12 to 18 liters per day. 22% of the cow produced 12 liters of milk per day on average, compared to 52% who produced 18 liters on average. The average daily milk yield, however, was discovered to be 15 liters.

NO.OF ANIMALS OBSERVED	MINIMUM YIELD (LITERS)	MAXIMUM YIELD (LITERS)	MEAN
100	12	18	15

DISCUSSION

The Surf Field Mastitis Test revealed a 41.0% overall prevalence of subclinical mastitis. A single quarter had a greater incidence of sub-clinical mastitis (19.5%), but when more quarters were afflicted, the prevalence decreased to 12.20% in the second quarter and 7.32% in the third. All four quarters saw the greatest percentage, 60.98%, though The results of this study showed a significant relationship between the following variables and the incidence of sub-clinical mastitis in cattle: udder size, floor type, age, season, lactation stage, parity, and frequency of floor cleaning.

That being said, farmers' animal keeping practices—including number, kind, and housing—have little effect on sub-clinical mastitis. Staphylococcus species were the most common pathogens causing subclinical mastitis. The reasons for the differences in SCM and Staphylococcus prevalence between studies could be attributed to differ. For instance, there is a clear link between low sanitation and hygiene during milking and higher incidence of mastitis. My findings confirm this by showing a clear correlation between an increasing prevalence and a certain management technique. Therefore, implementing stringent hygiene measures and periodically inspecting milking equipment may significantly lower the prevalence of subclinical mastitis. It was also discovered that cow-specific traits, such as age, breed, and lactation stage, had an impact on the risk of subclinical mastitis. Some age groups, breeds, and lactation phases of cows were more sensitive than others, based on our findings in sample size and sampling methods. Dairy farmers are encouraged to apply comprehensive mastitis management techniques that include the findings of this study. This study has a few shortcomings even if it provides useful information. It is impossible to determine causality from the study's cross-sectional design. Longitudinal studies are necessary to obtain additional understanding of the temporal relationships between risk factors and the development of subclinical mastitis. Because the research was conducted in District Muzaffargarh. My results demonstrated that careful attention to tight hygiene and nutrition control is necessary while undergoing mastitis treatments. It's mostly related to what I did. The severity of treating mastitis in fighting cows is demonstrated by this high incidence, particularly in regions where inadequate feeding and management practices are used. The need for interventions such as better housing, increased hygiene, and educating farmers on the usage of milk and mastitis prevention is highlighted by this new research.

CONCLUSION

The Surf Field Mastitis Test revealed a 41.0% overall prevalence of subclinical mastitis. A single quarter had a greater incidence of sub-clinical mastitis (19.5%), but when more quarters were afflicted, the prevalence decreased to 12.20% in the second quarter and 7.32% in the third. All four quarters saw the greatest percentage, 60.98%, though. The results of this study showed a significant relationship between the following variables and the incidence of sub-clinical mastitis in cattle: udder size, floor type, age, season, lactation stage, parity, and frequency of floor cleaning. That being said, farmers' animal keeping practices—including number, kind, and housing—have little effect on sub-clinical mastitis. Veterinarians can create a sensible mastitis

control program by using the information provided here.

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